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ABSTRACT

A study was conducted to: (1) test for the factorial validity of the 22-item Maslach Burnout Inventory (MBI) separately for 742 male and 801 female elementary school teachers and 659 male and 721 female secondary school teachers in Central Canada; (2) cross-validate findings across a second independent sample for each teacher group; and (3) test for invariant factorial structure across gender within each of the 2 teaching panels. Although confirmatory factor analysis supports a 3-factor structure, it also supports previous research in demonstrating the strong cross-loading of item 12 on the Emotional Exhaustion factor, and abnormally large correlated errors between items 1 and 2, items 10 and 11, and items 6 and 16. These results were invariant across the calibration/validation groups, across gender, and across elementary/secondary teaching panels. A retesting of content validity associated with these items is strongly recommended. Four tables and 1 figure present analysis results, and 34 references are listed. (Author/SLD)

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The Maslach Burnout Inventory: Testing for Invariant Factorial Structure Across Gender for Elementary and Secondary Teachers

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Paper presented at the XXV International Congress of Psychology, Brussels, 1992.

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Abstract

Purposes of the study were: (a) to test for the factorial validity of the Maslach Burnout Inventory (MBI) separately for elementary (males n=742; females n=801) and secondary (males n=659; females n=721) teachers, (b) to cross-validate findings across a second independent sample for each teacher group, and (c) to test for invariant factorial structure across gender within each of these two teaching panels. Although confirmatory factor analytic findings supported a 3-factor structure, they also supported previous research in demonstrating the strong cross-loading of Item 12 on the Emotional Exhaustion factor, and abnormally large correlated errors between Items 1 and 2, Items 10 and 11, and Items 6 and 16. These results were invariant across calibration/validation groups, across gender and across elementary/secondary teaching panels. A retesting of content validity associated with these items is strongly recommended.

The Maslach Burnout Inventory: Testing for Invariant Factorial Structure Across Gender for Elementary and Secondary teachers

Purposes of the study were threefold: (a) to test for the factorial validity of the Maslach Burnout Inventory (MBI) separately for male/female elementary and secondary teachers, (b) to cross-validate findings across a second independent sample for each of these populations, and (c) to test for invariant factorial measurement and structure across gender for each of the these two teaching panels.

The MBI is a 22-item instrument that was originally constructed from data based on samples of workers from a wide range of human service organizations. More recently, Maslach and Jackson in collaboration with Schwab developed the Educators' Survey (MBI Form Ed: 1986), a version of the MBI specifically designed for use with teachers. The MBI Form Ed parallels the original version of the MBI except for the modified wording of certain items to make them more appropriate to a teacher's work environment. Specifically, the generic term "recipient", used in the MBI to refer to clients, has been replaced by the term "students".

Most EFAs of the MBI have yielded three burnout factors representing EE, DP, and PA for human service professionals in

general (e.g., Green & Walkey, 1988; Maslach & Jackson, 1981b), and for teachers in particular (Beck & Gargiulo, 1983; Belcastro et al., 1983; Byrne, 1991a; Gold, 1984; Gold et al., 1989; Pierce & Molloy, 1989). Moreover, three recent CFA studies of the MBI also concluded a 3-factor solution to be optimal (Byrne, 1991a; Evans & Fischer, 1989; Gold et al., 1989).

Although it seems clear that the MBI is most adequately defined by a 3-factor solution, there is mounting evidence from construct validity research to suggest the need for content revision related to several items. For example, a number of researchers have reported Items 6, 16, and 20, designed to measure EE, to load either incorrectly or to cross-load onto the DP factor (Belcastro et al., 1983; Byrne, 1991a, 1992; Fimian & Blanton, 1987; Golembiewski, Munzenrider, & Carter, 1983; Green & Walkey, 1988), and Items 11 and 12, measuring DP and PA, respectively, to cross-load onto the EE factor (Byrne, 1991, 1992; Golembiewski et al., 1983; Green & Walkey, 1988; Powers & Gose, 1986). Further complicating these problematic loadings, however, is the finding of abnormally large correlated errors involving particular pairs of these items (Byrne, 1991a, 1992).

Clearly, further construct validity research is needed to more fully establish the factorial validity of the MBI. For example, one additional fact that needs to be determined is

whether these problematic loadings and error correlations hold across gender for teachers, or whether in fact they are gender-specific. Given recent findings of the differential impact of demographic (Byrne, 1991b; Greenglass, Burke, & Ondrack, 1990) and organizational factors (Greenglass, 1991) on burnout, as measured by the MBI across gender, it is important to know whether factorial validity of the instrument is invariant across males and females. Such construct validity research has not yet been conducted either for human service professionals in general, or for teachers in particular. This, then, was the task of the present study.

Method

Sample and Procedure

Participants in the study were full-time elementary and secondary school teachers from two large metropolitan areas in Central Canada. Using stratified proportional sampling procedures, a total of 7,000 elementary (n=3600) and secondary (n=3400) teachers were randomly selected from the membership roster of the Ontario Teachers' Federation; this represented approximately 30% of the teacher population across the two urban centers. A 46% response rate resulted in questionnaires being received from 3188 teachers. Listwise deletion of missing data ultimately yielded final samples of 2,625 teachers (elementary

n=1244; secondary n=1384).

Instrumentation

The MBI (Form Ed; Maslach, Jackson, & Schwab, 1986), designed to measure teacher burnout, is structured on a 7-point scale ranging from 0 "feeling has never been experienced", to 6 "feeling is experienced daily". The EE, DP, and PA subscales comprise nine, five, and eight items, respectively.

Several studies have reported on the psychometric properties of the MBI. Reliability has been shown to be moderately strong with alpha coefficients ranging from .52 to .91 (mean α=.77) (Beck & Gargiulo, 1981; Belcastro et al., 1983; Fimian & Blanton, 1987; Golembiewski et al., 1983; Iwanicki & Schwab, 1981; Leiter & Maslach, 1988; Maslach & Jackson, 1981b; Pierce & Molloy, 1989), and test-retest coefficients based on a 2 to 4-week interval ranging from .60 to .82 (mean r=.74) (Maslach & Jackson, 1981b). Strong evidence of convergent validity has been reported based on correlations between the MBI and external criteria that included personal experience (observations), dimensions of job experience, and personal outcomes (Maslach & Jackson, 1981b, 1986). Finally, discriminant validity, as evidenced by low and nonsignificant correlations between MBI scores, and job satisfaction and social desirability has been reported (Jackson et al., 1986; Maslach & Jackson, 1981b, 1986).

Analysis of the Data

Factorial validity of the MBI was tested using analyses of covariance structures within the framework of the confirmatory factor analytic (CFA) model. For purposes of cross-validation, male and female data were randomly split into two for each teaching level to form calibration and validation samples. Analyses were then conducted in three stages, and based on the EQS program (Bentler, 1989). First, CFA procedures were conducted to test the hypothesized 3-factor structure purported to underlie the MBI. Given findings of inadequate fit, the model was respecified to include additional parameters identified by the Lagrange Multiplier Test (LM-Test) as those that would contribute most to a significantly better-fitting model. Given adequate statistical, empirical, and theoretical justification, these parameters were subsequently incorporated into the model. Second, the final best-fitting model from Stage 1 was tested for its invariance across calibration and validation samples for each of the four teacher groups. Finally, the best-fitting model from Stage 1 was tested for its invariance across males and females separately for elementary and secondary teaching panels.

Assessment of model fit was based on multiple criteria that reflected statistical, theoretical, and practical considerations; these were: (a) the χ^2 likelihood ratio statistic, (b) the

Comparative Fit Index (CFI; Bentler, 1990), (c) the Satorra-Bentler Scaled Statistic (S-BSS; Satorra & Bentler, 1988), and (d) the substantive meaningfulness of the model (see MacCallum, 1986). The CFI is a revised version of the Bentler-Bonett (1980) normed fit index that adjusts for degrees of freedom. It ranges from zero to 1.00 and is derived from the comparison of a restricted model (i.e., one in which structure is imposed on the data) with a null model (one in which each observed variable represents a factor). The CFI provides a measure of complete covariation in the data; a value >.90 indicates a psychometrically acceptable fit to the data. The S-BSS incorporates a scaling correction for the χ^2 statistic when distributional assumptions are violated. Its computation takes into account the model, the estimation method, and the sample kurtosis values (Hu, Bentler, & Kano, in press). The S-BSS has been shown to more closely approximate χ^2 than the usual test statistic, to have robust standard errors, and to perform as well, or better than the usual asymptotically distribution-free (ADF) methods generally recommended for nonnormal multivariate data (Bentler, 1989; Hu et al., in press).

Results

The CFA model in the present study hypothesized a priori that: (a) responses to the MBI could be explained by three

factors, (b) each item would have a non-zero loading on the burnout factor it was designed to measure, and zero loadings on all other factors, (c) the three factors would be correlated and, (d) measurement error terms would be uncorrelated. A schematic representation of this model is presented in Figure 1. All analyses were based on covariance matrices and conducted separately for males and females in each teaching panel.

Insert Figure 1 about here

Preliminary analyses identified one multivariate outlier in the secondary female calibration sample, and one in the elementary male validation sample. Deletion of these cases resulted in calibration sample sizes of 372, 401, 330, and 360 for elementary males, elementary females, secondary males, and secondary females, respectively; validation sample sizes were 370, 400, 329, and 361 for the same groups, respectively. Although these analyses determined that the data were univariately normal,[1] there was some evidence of multivariate positive kurtosis for each teacher group; normalized Mardia coefficients were 37.14, 52.02, 40.37, and 34.14 for elementary male and female, and secondary male and female teachers, respectively. These findings emphasize the importance of testing

for multivariate normality in the analysis of covariance structures. While it is unlikely that the maximum likelihood estimates would be affected, nonnormality could lead to downwardly biased standard errors which would result in an inflated number of statistically significant parameters (Muthén & Kaplan, 1985). Thus, final assessment of statistical fit was based on the S-BSS which corrects for this violation.

Stage 1: Tests of the Hypothesized Model

Elementary Teachers

As shown in Table 1, by CFI values substantially less than .90, goodness-of-fit for the initially hypothesized model of MBI structure was less than adequate for both males and females. However, examination of the multivariate LM χ^2 coefficients revealed substantial improvement in model fit to be gained from the additional specification of one cross-loading (Item 12 on EE), and three correlated errors (between Items 1 & 2, 10 & 11, and 6 & 16); remarkably, these findings were consistent across gender. Incorporation of these parameters into the model resulted in a statistically better-fitting model[2] for both males and females. In both cases, the cross-loading was substantial and statistically significant ($p < .001$), as were the three correlated errors ($p < .001$).

Insert Table 1 about here

Secondary Teachers

As shown in Table 2, similar findings of model misfit were determined for secondary teachers. Again, for both males and females, the initially hypothesized model represented a less than adequate fit, and examination of the LM χ^2 coefficients indicated substantial improvement in model fit with the specification of the same cross-loading of Item 12 on EE, and the same correlated errors between Items 1 and 2, 10 and 11, and 6 and 16. Additionally, however, the LM Test indicated that for both males and females, model misfit could be improved substantially by the specification of a cross-loading from Item 11 to EE. For females only, however, failure to specify a correlated error between Items 9 and 19 proved to be an impoortant misspecification in the originally hypothesized model. As indicated in Table 2, incorporation of these additional parameters into the model for secondary teachers again led to statistically significant improvement in Model fit. A summary of factor and cross-factor loadings are presented in Table 3, and factor and corro correlations in Table 4.

Insert Tables 2-4 about here

Stage 2: Tests for Equality Across Calibration/Validation Samples

To test the replication of these findings for males and females of each teaching panel, the final model for each group was tested for its invariance across a second independent (i.e., validation) sample. As such, all primary and secondary (i.e., cross-loadings) factor loadings, factor covariances, and error correlations were constrained equal across calibration and validation samples, and then tested statistically in a simultaneous analysis of the data. Judgement of replicability was based on two criteria: (a) goodness-of-fit of the constrained model, and (b) probability level of the equality constraints as determined by the LM Test (equality constraints with $p<.05$ being untenable). Results for each teacher group revealed all constrained models to be well-fitting[3] (elementary males, $\chi^2_{(430)} = 888.59$, CFI=.93; elementary females, $\chi^2_{(430)} = 976.90$, CFI=.93; secondary males, $\chi^2_{(429)} = 875.22$, CFI=.93; secondary females, $\chi^2_{(428)} = 896.16$, CFI=.93), and all equality constraints to be tenable; probability values associated with these constraints ranged from .93 to .99 (M=.98) for elementary males, from .97 to .99 (M=.99) for elementary females, from .96 to 1.00 (M=.98 for

secondary males, and from .80 to .99 (M=.94) for secondary females. Since these findings argued for the statistical equivalence of model structure across independent samples, calibration and validation samples were subsequently combined for males and for females within each teaching panel. Tests for the invariance of factorial measurement and structure across gender were therefore based on full samples, less the multivariate outliers noted earlier (elementary males, n = 742; elementary females, n = 801; secondary males, n = 659; secondary females, n = 721).

Stage 3: Tests for Equality Across Gender

The focus of these analyses was to test for the equivalence of all primary and secondary factor loadings, factor covariances, and specified error covariances, across gender within each teaching panel. It is important to note that, in adherence to caveats related to partial measurement invariance, the gender-specific error covariance between Items 9 and 19 for females was left unconstrained across sex for this teaching panel (see Byrne, Shavelson, & Muthen, 1989).

Surprisingly, all equality constraints were found tenable across gender at both the elementary and secondary levels. As indicated by the CFI values, invariant models at both the elementary ($\chi^2_{(430)}$=1408.37; CFI=.93) and secondary

($\chi^2_{(428)}$=1252.50; CFI=.93) levels were well-fitting, and all equality constraints were tenable. For elementary teachers, probability values associated with these 26 constraints ranged from .63 to .99 (M=.88); for secondary teachers (27 constraints), they ranged from .54 to .99 (M=.91).

Discussion

Findings from this cross-validated study offer strong support for findings from previous factor analytic research bearing on the MBI, and illuminated even more, the pervasiveness of the problematic items noted earlier in the literature review. The fact that Item 12, designed to measure Personal Accomplishment, cross-loaded significantly onto the EE factor both across gender and across teaching level provides sound argument for a reexamination of its content. Clearly, the item is functioning inappropriately in its measurement of perceived Personal Accomplishment by teachers and needs to be revised. Similarly, the invariant cross-loading of Item 11 (Depersonalization) on EE across gender for secondary teachers substantiates other research reporting the same loading pattern and also argues for a revamping of item content. However, the question of why this cross-loading should be prominant for secondary and not for elementary teachers is not immediately clear. Further construct validity research based on these two

teaching panels is needed in order to untangle this phenomenon.

The importance of correlated errors in the present study, as in previous CFA studies of the MBI, perhaps needs further amplification. These parameters most often represent nonrandom measurement error due to method effects associated with the response format of measuring instruments and are therefore not unexpected in the CFA of a single measuring instrument (see e.g., Byrne, 1988a, 1988b; Byrne & Schneider, 1988; Newcomb & Bentler, 1986; Tanaka & Huba, 1984). Typically, however, indicators of such misspecified parameters range from 6.00 to approximately 15.00 for both LISREL Modification Indices and EQS LM χ^2 coefficients. In the present study, LM coefficients representing error correlations between item-pairs ranged from 57.42 to 110.90 for Items 1 and 2, from 31.52 to 111.47 for Items 10 and 11, and from 50.02 to 139.05 for Items 6 and 16. Not only did these coefficients far exceed the typical values, but they could be clearly delineated from coefficients representing correlated errors associated with other item-pairs in the scale. Given (a) the abnormally high LM χ^2s associated with these items compared with those associated with remaining item-pairs, (b) the substantively meaningful rationale for their specification as free parameters, (c) the fact that these findings were consistent with an earlier study by Byrne (1991), and (d) Bentler and Chou's

(1987) admonition that model specification which forces such error terms to be uncorrelated is rarely appropriate with real data, these parameters specified in models representing data from each of the four teacher groups.

Despite this common finding of correlated errors, there nonetheless remains considerable controversy in the CFA literature regarding their interpretability and cause, as well as an appropriate solution to the problem. Some might argue that large correlated errors such as the ones found here are clearly indicative of an additional factor. While this possibility is certainly one viable explanation of the phenomenon, past validity work with the MBI that rigorously tested this possibility (Byrne 1991a) showed this not to be the case.

One type of method effect that can lead to correlated errors is a high degree of overlap in item content. Certainly, this appeared to be the case with respect to the three item-pairs noted above. A review of zero-order correlations between these item-pairs revealed strong evidence of this for elementary males (Items 1 & 2 r=.74; Items 10 & 11 r=.59; Items 6 & 16 r=.67), elementary females (Items 1 & 2 r=.76; Items 10 & 11 r=.70; Items 6 & 16 r=.72), secondary males (Items 1 & 2 r=.78; Items 10 & 11 r=.67; Items 6 & 16 r=.62), and secondary females (Items 1 & 2 r=.71; Items 10 & 11 r=.76; Items 6 & 16 r=.64). Indeed, careful

reading of the content associated with each item-pair reveals one to be simply an alternate form of the other. In other words, each asks the same question, but in a slightly different way.

The MBI is clearly the most widely used measure of occupational burnout whether it be relative to human service professionals in general, or to teachers in particular. Because the validity of test scores is only as good as the measuring instrument from which the scores were derived, the psychometric soundness of the instrument is critical. Given cross-validated findings that clearly elucidate content-related problems associated with the MBI when used with teaching professionals, the authors of the instrument are urged to reexamine its structure in light of these recent statistically rigorous studies.

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Table 1

Goodness-of-Fit Statistics for Elementary Teachers

Model	χ^2	df	CFI	S-B χ^2	CFI*
Males					
1 Hypothesized Model	693.85	206	.85	569.28	.86
2 Final Model	445.22	202	.92	370.99	.94
•Item 12 cross-loaded on EE					
•Correlated error between Items 1 & 2, 10 & 11, 6 & 16					
Females					
1 Hypothesized Model	839.12	206	.84	642.81	.85
2 Final Model	488.90	202	.93	383.40	.94
•Item 12 cross-loaded on EE					
•Correlated errors between Items 1 & 2, 10 & 11, 6 and 16					

* Based on S-B χ^2

Table 2

Goodness-of-Fit Statistics for Secondary Teachers

Model	χ^2	df	CFI	S-B χ^2	CFI*
Males					
1 Hypothesized Model	708.19	206	.83	536.62	.86
2 Final Model	438.47	201	.92	338.45	.94
•Items 11 and 12 cross-loaded on EE					
•Correlated error between Items 1 & 2, 10 & 11, 6 & 16					
Females					
1 Hypothesized Model	825.27	206	.81	663.36	.82
2 Final Model	438.44	200	.93	357.77	.94
•Items 11 and 12 cross-loaded on EE					
•Correlated errors between Items 1 & 2, 10 & 11, 6 & 16, 9 & 19					

* Based on S-B χ^2

Table 3

Standardized Factor Loading Estimates from Final Models[a] (Calibration Samples)

Parameters	Elementary		Secondary	
	Males (n=372)	Females (n=401)	Males (n=330)	Females (n=360)
Factor Loadings				
• Item 1 on EE	.74*	.75*	.72*	.70*
• Item 2 on EE	.69	.72	.66	.71
• Item 3 on EE	.76	.75	.73	.72
• Item 6 on EE	.59	.56	.62	.58
• Item 8 on EE	.86	.85	.88	.85
• Item 13 on EE	.78	.74	.76	.78
• Item 14 on EE	.62	.64	.63	.63
• Item 16 on EE	.62	.58	.59	.57
• Item 20 on EE	.70	.78	.73	.75
• Item 5 on DP	.60*	.64*	.57*	.65*
• Item 10 on DP	.55	.64	.66	.58
• Item 11 on DP	.65	.69	.35	.33
• Item 15 on DP	.64	.56	.60	.70
• Item 22 on DP	.44	.38	.54	.49
• Item 4 on PA	.45*	.44*	.28*	.49*
• Item 7 on PA	.52	.63	.54	.62
• Item 9 on PA	.60	.61	.62	.65
• Item 12 on PA	.42	.36	.45	.41
• Item 17 on PA	.70	.66	.59	.56
• Item 18 on PA	.66	.67	.72	.70
• Item 19 on PA	.64	.70	.69	.67
• Item 21 on PA	.47	.46	.40	.43
Factor Cross-loadings				
• Item 11 on EE	---	---	.36	.24
• Item 12 on EE	-.32	-.42	-.38	-.41

[a] All parameter estimates statistically significant ($p<.001$)

* Fixed parameter for purposes of statistical identification

EE=emotional exhaustion; DP=depersonalization; PA=personal accomplishment

Table 4

Factor and Error Correlation Estimates[a]
(Calibration Samples)

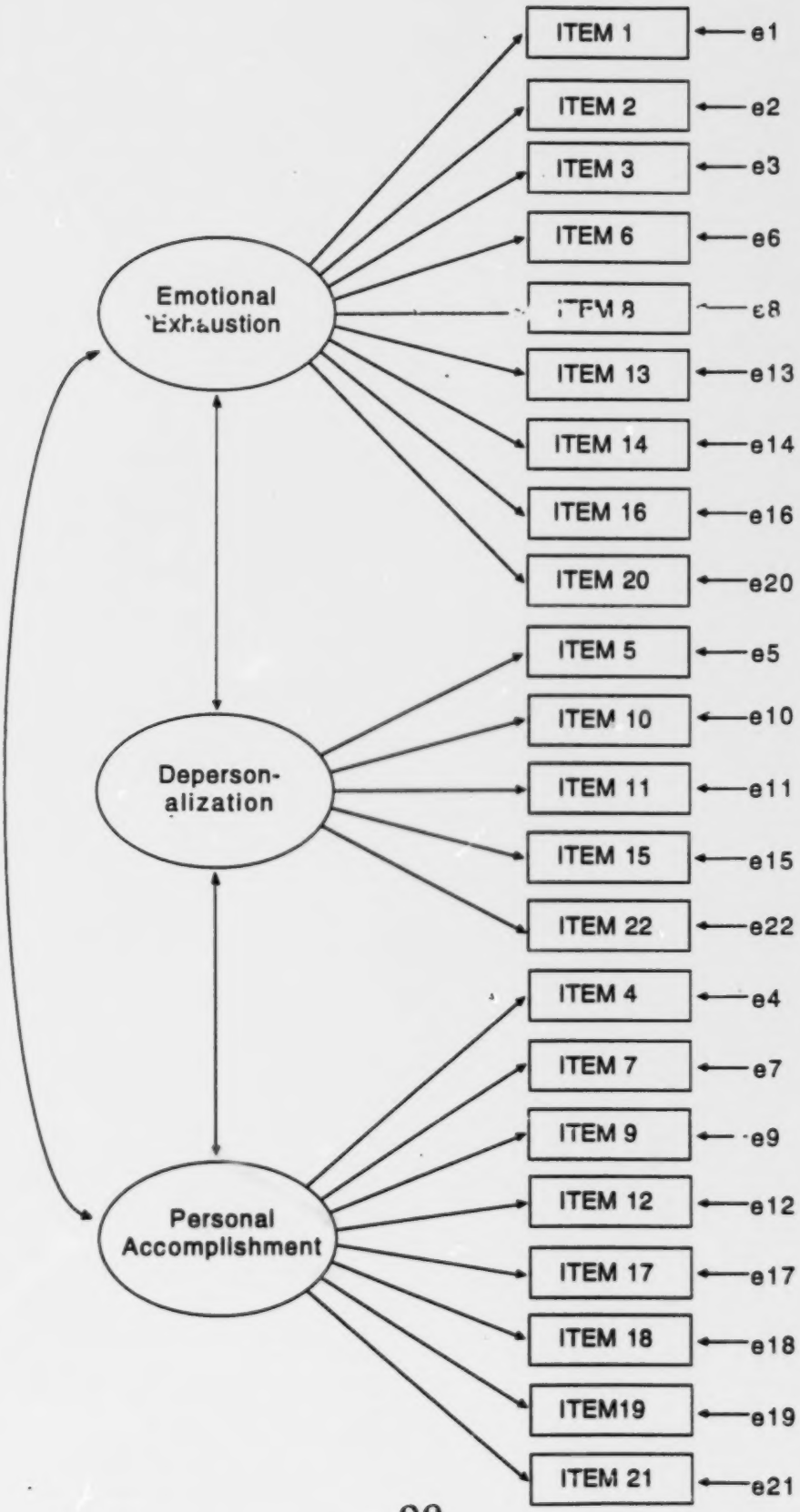
Parameters	Elementary		Secondary	
	Males (n=372)	Females (n=401)	Males (n=330)	Females (n=360)
Factor Correlations				
• EE/DP	.69	.67	.64	.46
• EE/PA	-.31	-.42	-.43	-.26
• DP/PA	-.45	-.62	-.49	-.45
Error Correlations				
• Items 1 & 2	.47	.47	.57	.43
• Items 10 & 11	.37	.46	.40	.71
• Items 6 & 16	.49	.58	.51	.45
• Items 9 & 19	---	---	---	.45

[a] All parameter estimates statistically significant ($p<.001$)

EE=emotional exhaustion; DP=deperesonalization; PA=personal accomplishment

Figure Caption

Figure 1. Hypothesized Model of Factorial Structure for the Maslach Burnout Inventory


Emotional Exhaustion
Deperson-alization
Personal Accomplishment
ITEM 1
ITEM 2
ITEM 3
ITEM 6
ITEM 8
ITEM 13
ITEM 14
ITEM 16
ITEM 20
ITEM 5
ITEM 10
ITEM 11
ITEM 15
ITEM 22
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